U.S. ENVIRONMENTAL PROTECTION AGENCY

SUPERFUND PROPOSED PLAN

CABOT CARBON/KOPPERS SUPERFUND SITE

Gainesville, Alachua County, Florida

July 2010

This document has been prepared to provide the general public with an understanding of the activities that have been occurring at the Cabot Carbon/Koppers Site. For technical information, please review the documents in the Administrative Record located at the information repositories.

Introduction

The U.S. Environmental Protection Agency (EPA) is releasing this Proposed Plan (Plan) for the environmental cleanup at the Koppers portion of the Cabot Carbon/Koppers Superfund Site in Gainesville, Alachua County, Florida. This Proposed Plan identifies the preferred alternative for cleaning up the Koppers Site and provides rationale for this preference. It includes summaries of other remedial alternatives evaluated and the findings in the Remedial Investigation (RI), Baseline Risk Assessments, a new (2010) Feasibility Study (FS), and other documents included in the Administrative Record. EPA is issuing this Plan as part of its public participation responsibilities under Section 300.430(f)(2), of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This document is issued by EPA, the lead agency for Site activities. EPA, with support from the Florida Department of Environmental Protection (FDEP), will select a final remedy for the Site after reviewing and considering all information submitted during the 30-day public comment period.

Public participation is an important part of the Site cleanup decision process. Based on public comments, EPA, along with FDEP, may modify the preferred alternative or select another alternative presented in this Plan.

Public Comment Period
July 15, 2010 to August 15, 2010

Public Meeting
Date: August 5, 2010
Time: 6:00-8:00 p.m.

Location: Stephen Foster Elementary School
3800 Northwest 6th Street
Gainesville, Florida 32609

The community is invited to a public meeting where EPA will present its understanding of Site conditions, alternatives evaluated in the Feasibility Study, and provide its rationale for the preferred alternative presented in this Plan. In addition, this meeting provides the community with an opportunity to ask EPA questions about the preferred alternative or Site activities and finding.

The Administrative Record file for the Cabot Carbon/Koppers Site is available at the following location:

Alachua County Library
401 E. University Ave.
Gainesville, FL 32601
(352) 334-3900
www.aclib.us/locations/headquarters

Therefore, the public is encouraged to review and comment on the cleanup alternatives presented in this Plan.

What is a Proposed Plan?

A Proposed Plan presents EPA's preferred alternative to address contamination at a Site, presents other alternatives that were evaluated, and provides the rationale for EPA's preferred alternative. In addition, the Plan solicits public involvement and comment on the Site's remedy selection process. Issuance of this Plan is part of the Superfund process depicted below.

What are the next steps in the Superfund process?

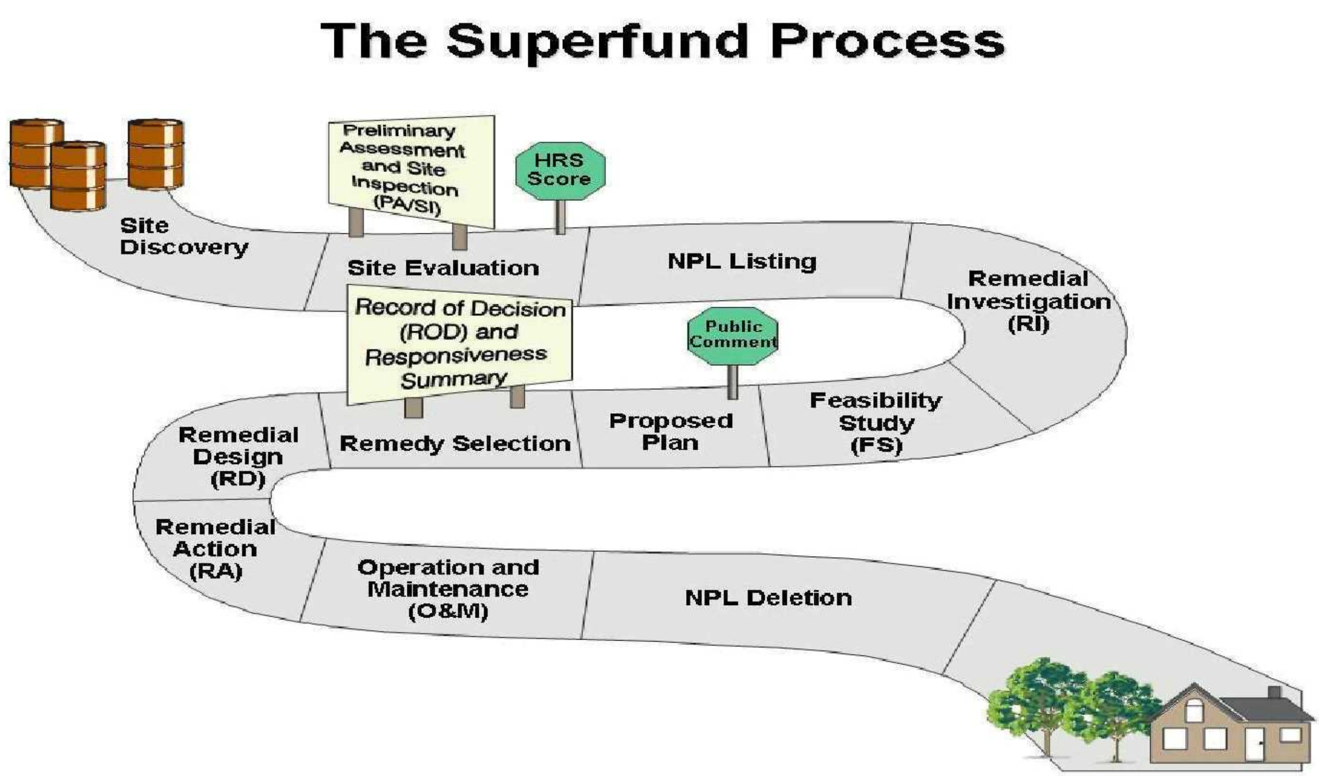
EPA will hold a public meeting on Thursday, August 5, 2010, 6:00 p.m. at Stephen Foster Elementary School. The purpose of the meeting is to present the Proposed Plan for cleaning up the Koppers Site. This meeting will provide an opportunity for citizens to ask questions of EPA representatives. Questions and answers will be recorded to assist EPA in the final selection of the remedy and in preparation of a Record of Decision (ROD). All comments received during the public comment period and corresponding responses will be documented in the Responsiveness Summary of the ROD.

The public comment period for this Plan starts on July 15, 2010 and ends August 15, 2010.

During this 30-day period, the public is encouraged to review the findings of the RI and the details of the alternatives presented in the final FS. These and other documents are available at the information repository listed on page 34 of this document. Citizens are encouraged to submit written comments to EPA.

Following the public comment period, EPA will carefully consider all public comments before selecting the remedy for the Site. All comments submitted in writing by August 15, 2010, will be addressed in the Responsiveness Summary, as will the questions and answers discussed at the public meeting. If you are not on the Site mailing list and would like to be, please contact Ms. LaTonya Spencer at 404-562-8463 or 1-800-435-9234.

A ROD, which summarizes the remedy decision process and announces the remedy will be prepared and signed by EPA. Once the ROD is



issued, the design of the remedy will be scheduled and conducted, followed by the implementation of the remedy.

Site History

The Cabot Carbon/Koppers Superfund Site encompasses approximately 170 acres, bridging two properties in a commercial and residential area of the northern part of the Gainesville city limits, Alachua County, Florida. This Site was originally two Sites; Cabot Carbon in the southeast portion of the Site, and Koppers on the western portion of the Site (Figure 1). Cabot Carbon, is currently inactive, is now in use as commercial property. Koppers was an active facility until December 2009. On March 31, 2010, Beazer East, Inc. purchased the property from Koppers in order to facilitate remediation.

The Cabot Carbon portion of the Site was operated as a pine tar and charcoal generation facility from 1911 until 1967. Process wastewater containing residual pine tar was discharged to three unlined lagoons as early as 1937.

The Koppers Site operated as a wood-treating facility from 1916 to late 2009 and covers approximately 86 acres (Figure 1 and Figure 2). Portions of the area east of the Koppers Site and north of the former Cabot Carbon property are now commercial properties; other portions remain undeveloped. The areas to the west and north are single-family and multi-family residences. A Gainesville Public Works facility, small businesses, and a mobile home community are located to the north/northwest of the Site. A small drainage ditch that currently runs through the Koppers Site collects storm water from the property and directs it north. The drainage exits the property at a point along the northern boundary and discharges into Hogtown Creek, which then flows into Springstead Creek.

The Murphree Well Field is located approximately 2 miles northeast of the Site (Figure 1). This 26 million-gallon-per-day (mgd) well field is operated by the Gainesville Regional Utilities (GRU) and provides public water supply for the City of Gainesville and other areas in Alachua County. The Murphree Well Field withdraws water from the Upper Floridan Aquifer (UFA). Under the Koppers Site, the UFA is overlain by the Hawthorn Group (HG) and by the Surficial Aquifer (Figure 3). In documents for this Site, the two water-bearing zones in the UFA have been designated the upper and lower transmissive zones of the UFA, and the two zones in the HG with moderate permeability have been designated the Upper Hawthorn and the Lower Hawthorn.

Former wood-treatment facilities are located within the southeastern portion of the Koppers Site (Figure 2). This includes a recently-active process building and adjacent drip tracks where chromated copper arsenate (CCA) was used to preserve wood. The central and northern portions of the Site were recently used for wood storage, staging, and debarking. The Koppers Site was serviced by railroad sidings that entered at the facility's northeast corner. These sidings connected to a rail spur of the CSX railroad that still exists along the eastern boundary of the Koppers Site.

Wood treating processes at the Koppers Site began with a creosote impregnation process in 1916. The treatment processes were modified over the years to include two additional processes: one using CCA, beginning in the 1960s, and another using pentachlorophenol (penta), beginning in 1969. The use of creosote decreased in the 1970s and creosote use was completely phased out at the Site by 1992. Pentachlorophenol use was discontinued by 1990. Koppers used only CCA to treat wood at the Site from 1990 through 2009.

The Former North Lagoon and Former South Lagoon (Figure 2) at the Koppers Site were used to manage process wastewater. Based on historical aerial photographs, the Former North Lagoon was active from approximately 1956 until the 1970s, and the Former South Lagoon was active from 1943 or earlier through 1975 or 1976. Both former lagoons have been closed, covered, and graded. The CCA wood-treating

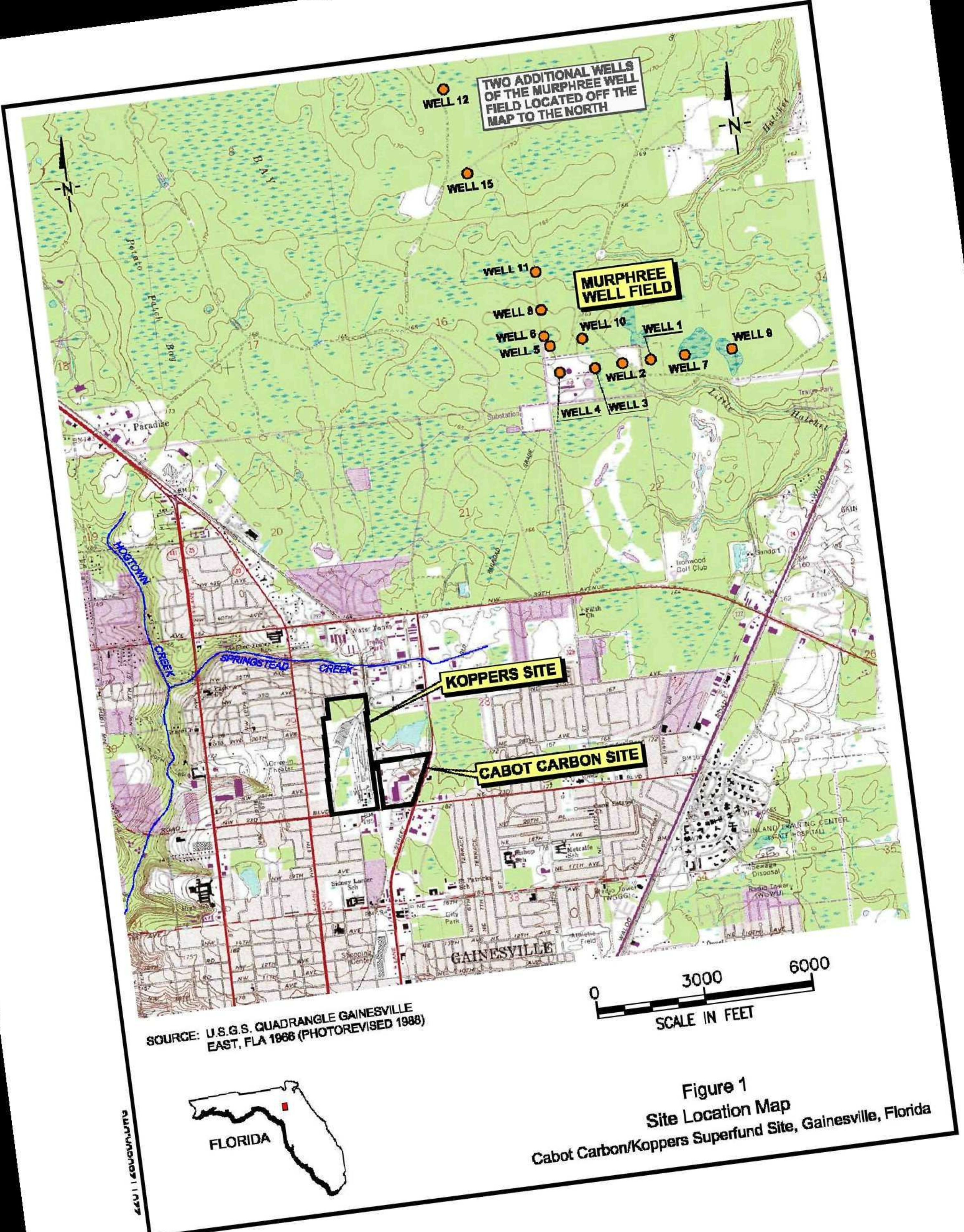
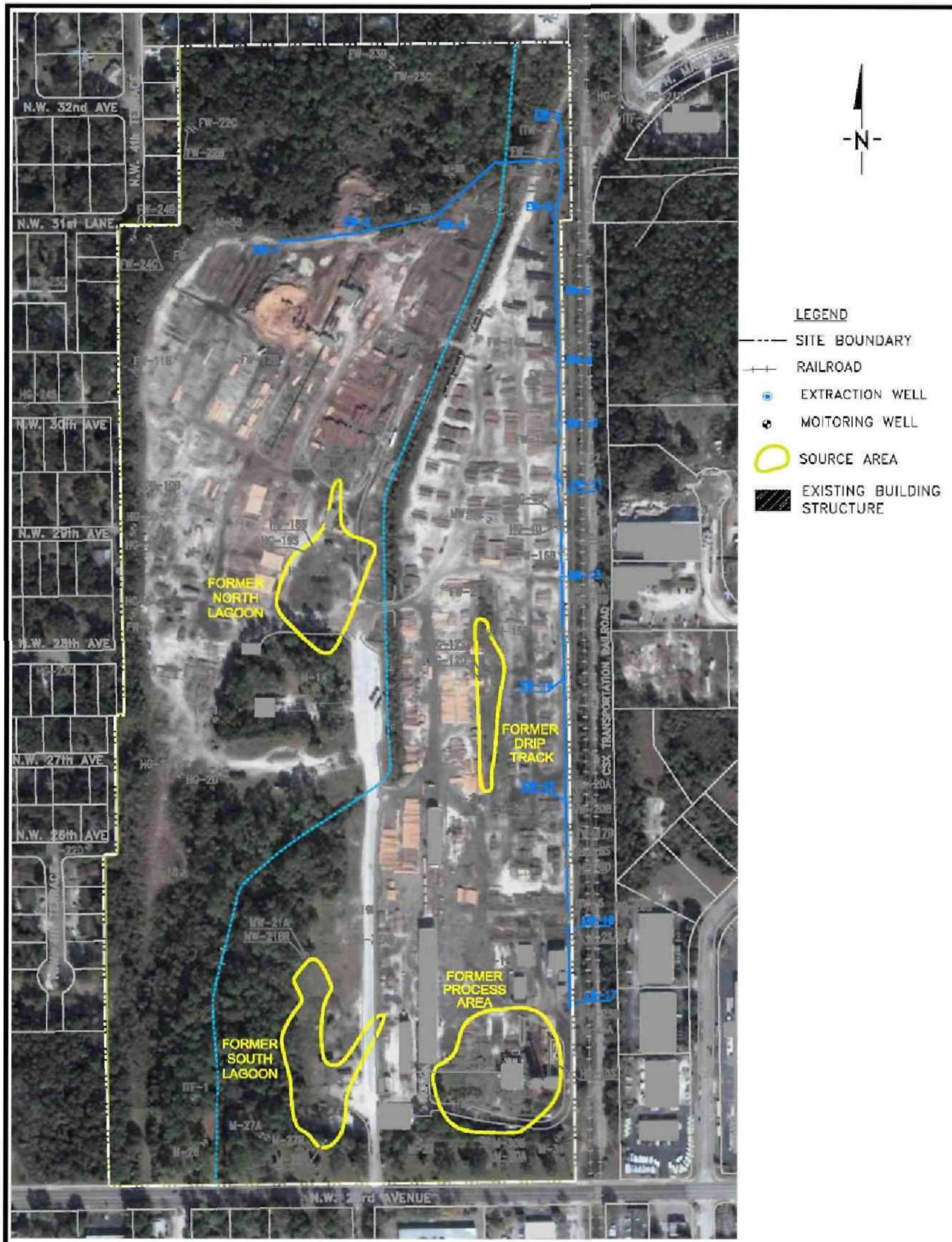


Figure 1
Site Location Map
Cabot Carbon/Koppers Superfund Site, Gainesville, Florida



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SCALE IN FEET

Figure 2
Site Map and Aerial Photograph
Cabot Carbon/Koppers Superfund Site, Gainesville, Florida

process used most recently at the Site did not generate wastewater.

The Cabot Carbon/Koppers Site was proposed for the National Priorities List (NPL) in September 1983, and listed as final on the NPL in September 1984. Remedial investigations at the Site began in 1983. An initial groundwater interceptor trench was installed on the Cabot Carbon portion of the Site in 1985, and a permanent subsurface collection system was installed in 1995, with the groundwater discharging to the principally-owned treatment works (POTW). A POTW is a wastewater treatment facility that is owned by a state or municipality. The Cabot portion of the Site has been redeveloped and currently contains a commercial shopping mall, a car dealership, and a series of small stores and businesses. Therefore, in this Plan, the word "Site" refers to the Koppers portion of the Cabot Carbon/Koppers Superfund Site, unless otherwise specified.

The remedial investigation (RI) was completed in 1987, and a Supplemental RI was completed in 1989. A Baseline Risk Assessment and FS were completed in 1990. A remediation plan was selected and a ROD for the Cabot Carbon/Koppers Site was signed in1990. For the Koppers property, the ROD specified (1) excavation of soils in the Former North and South Lagoons to a depth of 4 feet, (2) bioremediation of soils in the Former Process area and Former Drip Track Area by recirculating groundwater with nutrient amendment, (3) installation of a groundwater extraction system in the Surficial Aquifer, and (4) long-term institutional controls on Site use. At the time the ROD was prepared and signed, it was concluded that, based upon then-current information, (a) the HG was a single thick clay layer that provided an effective vertical barrier for groundwater flow and transport and (b) the potential source zones were primarily in the shallow unsaturated zone with a small volume of impacted soil below the water table in the Surficial Aquifer.

In March 1991, the EPA issued a Unilateral Administrative Order (UAO) to Beazer East directing development of a remedial design for the Site. However, further investigation revealed Site conditions that were not contemplated by the ROD or UAO. Specifically, groundwater impacts below the water table were greater than expected and the amount of dense non-aqueous phase liquid (DNAPL) below the water table was greater than expected. These discoveries called into question the potential effectiveness and practicality of the ROD-specified removal actions. A Surficial Aquifer groundwater extraction system was designed to prevent off-Site migration of contamination in shallow groundwater, and operation began in 1995. In 2009, this Surficial Aquifer groundwater extraction system was upgraded to increase pumping capacity and capture contaminated groundwater through placement of recovery trenches next to the 4 principal source areas. Currently, fourteen groundwater extraction wells operate along the northern and eastern property boundaries, and groundwater recovery drains operate near each of the four principal source areas.

Based on post-ROD Site data and concerns regarding the technical practicability of the selected remedy, the UAO was amended in April 1994, This amendment required additional Site characterization and development of a Supplemental FS that included remedial alternatives appropriate for the expanded extent of Site impacts. Subsequently, studies were conducted to identify a revised remediation strategy based on an updated understanding of the Site.

A Supplemental FS was prepared in 1997 based on the existing and updated data and an improved understanding of flow and transport mechanisms at the Site. A Revised Supplemental FS was issued in 1999 to address comments from both EPA and FDEP. The Revised Supplemental FS recognized that the potential impacts from source areas were deeper than contemplated by the 1990 ROD; however, the potential impacts within and below the HG were still considered negligible at that time.

More recent investigations (2003, 2004, and 2006) that form the basis for this cleanup plan have indicated that dense non-aqueous phase liquids (DNAPL) from former wood-treating substances such as creosote is present in the HG and that Site contaminants are present in groundwater in the Upper Floridan Aquifer (See Figure 3). Ongoing and planned monitoring is being used to better characterize potential impacts in the Surficial Aquifer, HG, and UFA.

Since the 1990 ROD, as investigations have improved the conceptual understanding of the Site, pilot remedial actions and focused studies have been conducted to assist with the selection and evaluation of a final comprehensive remedial strategy for the Site. These activities have included:

- Pilot testing active DNAPL recovery in the Surficial Aquifer at PW-1 in 1994 and 2004;
- Studying vertical groundwater circulation at the Former North Lagoon in 1995;
- Recovering DNAPL Manually by periodic bailing in HG monitor wells since 2004;
- Evaluating soil excavation feasibility;
- Evaluating in-situ thermal treatment feasibility;
- Evaluating surfactant flushing feasibility;
- Pilot testing active DNAPL recovery in the HG beneath the Former North Lagoon; and
- Bench testing and pilot field testing in-situ biogeochemical stabilization (ISBS) of DNAPL using modified permanganate solutions.

Two five-year reviews for the Site were conduced by EPA and finalized in 2001 and 2006. The 2006 Five-Year Review Report recommended additional studies to support the selection of a new remedial strategy to address the full extent of impacts at the Site. Such studies have been undertaken through the collaborative FS process to fulfill the specific recommendations of the Five-Year Review.

A revised FS was finalized in May 2010.

Environmental Investigation Results

Numerous remedial and environmental investigations have been performed at the Site. These include:

- Hydrogeologic investigation;
- Initial and supplemental RIs;
- Site characterization for soil and groundwater remedies;
- Field investigations of the HG and UFA;
- Source delineation study for former source areas;
- Data summary report for soil and sediment; and
- Surficial Aquifer well redevelopment and sampling.

Site soil and groundwater have been sampled to characterize the nature and extent of Site-related contamination. Over 350 soil borings and 1,000 soil samples have been collected and analyzed across the Site since 1984. Groundwater monitoring has been routinely performed since 1984. Over 150 wells have been installed (and sampled) at the Site in the three main hydrogeologic units (Surficial Aquifer, HG, and UFA) (See Figure 3). Periodic groundwater monitoring reports are prepared for the EPA.

Potential impacts to off-Site areas have been investigated and continue to be investigated west of the Site. An additional off-Site soil investigation is currently being conducted to completely delineate the extent of impact in other areas surrounding the Site. Some information and analytical data has been generated from sediment and surface water in Hogtown and Springstead Creeks to evaluate impacts to aquatic habitats and species.

The contaminants of concern (COCs) identified for soil and groundwater in the 1990 ROD include phenols (such as penta), polycyclic aromatic hydrocarbons (PAH), arsenic, and chromium. Creosote, the predominant chemical material historically used for wood treatment at the Site, consists mainly of PAHs and includes both potentially carcinogenic (pcPAH) and non-carcinogenic (ncPAH) compounds. The EPA and FDEP also required sampling and testing for polychlorinated dibenzo-p-dioxins and polychlorinated dibenzo furans (dioxins/furans) in soils. Based on the results of this sampling, dioxins/furans have also been identified as COCs for Site soil. Relatively low benzene, toluene, ethylbenzene, and xylenes (BTEX) concentrations also have been observed in soils and groundwater under the four identified source areas.

Conceptual Site Model

A conceptual Site model (CSM) was formulated as part of the revised FS using environmental investigation data collected over the past 26 years. The CSM describes current Site conditions and how Site-related contaminants move in the environment and the potential for contaminants to reach environmental receptors. Figure 3 is a conceptual block diagram that depicts migration of contaminants in the subsurface.

Groundwater Flow

Hydrogeologic layers beneath the Site are illustrated on Figure 3. The layers vary in their ability to transmit groundwater (transmissivity). Zones 1, 7, and 9 are the most transmissive. Zones 3, 5, 8, and 10 are moderately transmissive. Zones 2, 4, and 6 have very low capacities to transmit water, and limit vertical flow between transmissive layers. Groundwater flow within the transmissive layers that have shown the highest COC concentrations (Zones 1 and 3) is to the north-northeast.

Source Areas

The origin of contaminants at the Site is linked directly to facility operations and historical waste management methods. Releases occurred when wood-treatment chemicals dripped onto the soil or were deposited in unlined lagoons. Site investigations have identified four main contaminant source areas related to former operations and facilities (the Former Process Area, the Former South Lagoon, the Former North Lagoon, and the Former Drip Track). These are labeled [a] through [d] in Figure 3, and are illustrated in Figure 2.

Source areas defined in these figures correspond with the areas in the Surficial Aquifer containing the greatest concentrations of contaminants associated with wood-treatment materials. The wood-treating products that remain in the environment (e.g., creosote DNAPL, free-product PCP, etc.) are defined as the principal threat waste at this Site. Based on the physical and chemical properties of DNAPL and its variable distribution throughout the various aquifer zones under the Site, it is impracticable to distinguish heavily-contaminated soil from principal threat waste. Based on this uncertainty, it is prudent to address the entire soil volume in the four Source Areas as principal threat waste. This approach will ensure that the vast majority of DNAPL and heavily-contaminated soil can be treated and isolated from the surrounding environment.

Analytical data for source area soil borings indicate that DNAPL has migrated down into the Lower HG, but the extent to which this has occurred is uncertain and difficult to determine definitively. Remedial actions proposed as a part of this Plan are intended to address DNAPL (i.e., principal threat waste) impacts, regardless of its location or source origination on the Koppers Site.

Other smaller isolated surface soil areas throughout the property show high concentrations of various contaminants that are not associated with any particular process area on the property. These minor locations of elevated contaminant concentrations are not identified as source areas, but as locations of contaminants that either migrated from source areas (i.e., by surface runoff, soil dust deposition, or other surface transport mechanism), or are isolated residuals from historic wood treating operations.

Soil Contamination

Soils above the water table contaminated with contaminants of concern (COCs) are a result of residual DNAPL in unsaturated pore space or contaminants that are adsorbed onto soil particles. Asenic, pcPAHs (expressed as benzo(a)pyrene toxic equivalents [BaP-TEQ]),

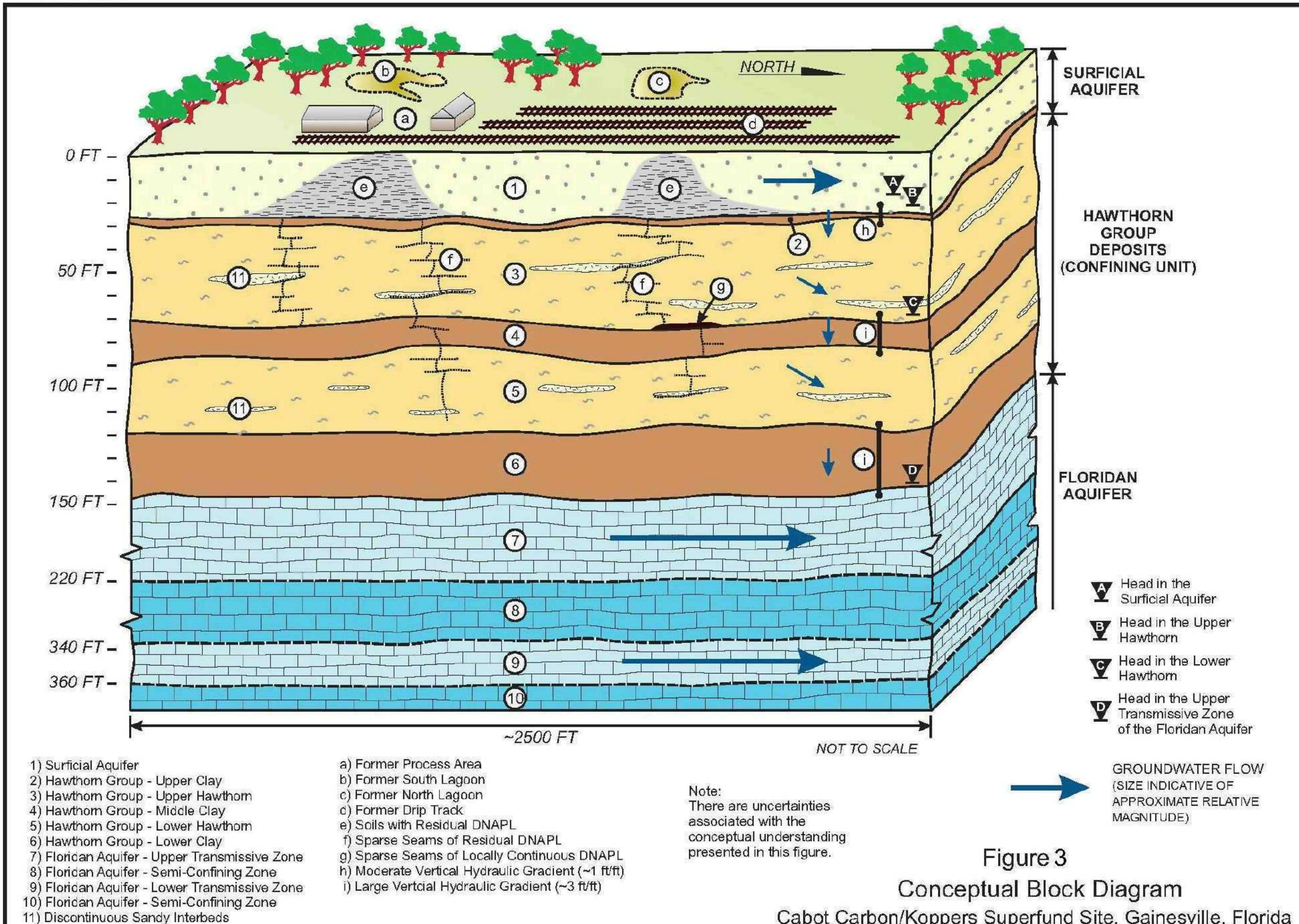

Figure 3
Conceptual Block Diagram
Cabot Carbon/Koppers Superfund Site, Gainesville, Florida

and dioxins/furans (expressed as 2,3,7,8-tetrachlorodibenzo-p-dioxin toxic equivalents [TCDD-TEQ]) are COCs that drive the evaluation of human-health risk for direct soil exposure at the Site under current Site use.

The highest arsenic concentrations were detected in the vicinity of the Former South Lagoon, two sample locations had average surface soil concentrations above 1,000 milligrams per kilogram (mg/kg) for arsenic.

Elevated PAH concentrations were detected in surface soils at all four DNAPL source areas. Dioxins/furans were detected over a significant portion of the Site at levels above the Florida default commercial/industrial soil cleanup target level (SCTL) (0.03 micrograms per kilogram [μg/kg]).

Concentrations of pentachlorophenol in surface soil were below the Florida default SCTL for commercial/industrial direct exposure (28 mg/kg) over most of the Site. There were five exceptions: three in the Former Process Area, one at the Former Drip Track Area, and one at the Former North Lagoon.

A multi-phase Site-boundary and off-Site soil sampling and analysis program is presently being conducted. Initial results from this program show that surface soil immediately adjacent to the western Site boundary has elevated concentrations of PAHs, arsenic, and/or dioxins/furans above Florida default SCTLs for residential direct exposure. Past transport of COCs via dust likely caused the detections of Site COCs in off-Site surface soil west of the Site. Further off-Site soil characterizations are under way to the north, south, east, and west of the Site and will continue after remedy selection to facilitate expedited cleanup of off-Site residential areas.

Off-Site Creek Contamination

Investigative work has been done in Hogtown and Springstead Creeks, north of the Koppers Site. These studies were done to support evaluation of possible impacts to ecological habitats and species in these surface water bodies. Since inputs to both Springstead and Hogtown Creek are attributable to releases from both the Koppers facility and the Cabot Carbon facility, cleanup will be performed jointly.

Groundwater Contamination

Groundwater impacts have resulted from: (a) percolation of contaminants in process water down to the water table; (b) dissolution of contaminants from DNAPL in the subsurface; and (c) leaching from soils as rainwater percolates through the unsaturated zone in areas with high concentrations of COCs.

Surficial Aquifer Groundwater

The predominant PAH compound detected in groundwater at the Site is naphthalene. Naphthalene is used as the primary indicator compound to represent the presence and extent of COCs in Site groundwater due to its prevalence and very high mobility. As part of the effectiveness monitoring for the existing groundwater extraction system, groundwater quality is measured periodically at extraction wells and monitor wells. Groundwater samples are analyzed for benzene, toluene, ethylbenzene and xylenes (BTEX), PAHs, phenols, arsenic, and chromium. Several of the wells near the source areas and near the eastern Site boundary have naphthalene concentrations greater than the Florida default groundwater cleanup target level (GCTL) of 14 μg/L. In all locations where both a water-table and deeper Surficial Aquifer well were sampled, the water-table well had a significantly lower naphthalene concentration. Concentrations of some other COCs (PCP, arsenic, benzene, carbazole, dibenzofuran) also exceeded their default GCTLs and/or federal maximum contaminant levels (MCLs) in certain wells.

Hawthorn Group Groundwater

Naphthalene and other COCs have been detected at monitor wells near source areas and near the eastern property boundary at concentrations exceeding default GCTLs.

Upper Floridan Aquifer Groundwater

Water quality in the UFA beneath and immediately downgradient (in the direction of groundwater flow) of the Site is measured on a quarterly basis.

Monitor wells within the top 30 feet of the UFA. Only one of these wells (a source-area monitoring well near the Former North Lagoon) currently has organic concentrations above state or federal drinking water standards. Naphthalene concentrations at this well have decreased substantially since July 2004.

There are 15 multiport, quadruple-cased wells quadruple-cased wells completed within the upper 100 feet of the UFA (the Upper Transmissive Zone). At two of the four source areas (Former Process Area and Former South Lagoon), inorganic and organic contaminants are consistently below state or federal drinking water standards in the UFA monitor wells. Seven organic contaminants are above state or federal drinking water standards in the UFA north of the Former North Lagoon and Former Drip Track at a few locations.

Organic COCs have never been detected in the four Lower Transmissive Zone wells at the northern property boundary.

In some sampling events, arsenic concentrations above the Florida default GCTL (10 µg/L) have been identified in groundwater collected from a few of the UFA monitor wells. These low observed concentrations likely result from dissolution of naturally occurring minerals in the UFA that occurs when oxygenated water is introduced to the formation during well drilling. This is consistent with the absence of inorganic COCs in overlying aquifers.

Scope and Role of Proposed Remedy

The proposed remedy is intended to be the final cleanup for the Cabot Carbon/Koppers Site. The preferred alternative identified in this Proposed Plan, or one of the other active measures considered in this plan, will protect public health, welfare, and the environment from actual or threatened releases of hazardous substances into the environment.

Site Risk Assessment

Risk assessments were conducted to determine the current and future effects of contaminants on human health and the environment. "What Is Risk and How Is It Calculated" provides general information on assessing risk. A human-health risk assessment (HHRA) for on-Site soils and sediment was submitted in 2009 and updated in May 2010 to take into account a change in land use and to incorporate comments received on the earlier version. The estimates of potential risk presented in the August 2009 HHRA assume that the use of the Site is for wood-treatment in the foreseeable future because wood-treatment operations have ceased, this assumption is no longer valid. The HHRA was updated to take into account a change in land use not previously contemplated under the 2009 submittal.

The 2009 HHRA includes both a deterministic (traditional) evaluation of potential risks and a more quantitative probabilistic model for potential risk evaluation. The assessment shows that pcPAHs, arsenic, and dioxins/furans are the COCs that make the largest contribution to the overall potential excess lifetime cancer risk associated with the Site. Potential exposure to pentachlorophenol makes a small contribution to the total potential excess lifetime cancer risk.

EPA has evaluated the 2009 HHRA and its accompanying revisions and has determined that the probabilistic risk assessment does not provide an adequate basis to define the required cleanup goals. Therefore, EPA will base selection of cleanup goals on a more conservative cleanup goal derived from deterministic risk calculations.

Potential ecological risks associated with sediment were also evaluated in 2009. The Agency has evaluated the 2010 ecological screening level risk assessment and its accompanying revisions and does not believe that it provides an adequate basis to select remedial goals for the Site. This is because this assessment was based on assumptions used in

What Is Risk And How Is It Calculated?

A Superfund human health risk assessment estimates the "baseline risk." This is an estimate of the likelihood of potential health problems occurring if no cleanup action were taken at a Site. To estimate the baseline risk at a Superfund Site, EPA undertakes a four-step process:

Step 1: Analyze Contamination.
Step 2: Estimate Exposure.
Sept 3: Assess Potential Health Dangers.
Step 4: Characterize Site Risk.

In Step 1, EPA looks at the concentrations of contaminants found at a Site as well as past scientific studies on the effects these contaminants have had on people (or animals, when human studies are unavailable). Comparisons between Site-specific concentrations and concentrations reported in past studies help EPA to determine which contaminants are most likely to pose a potential threat to human health.

In Step 2, EPA considers the different ways that people might be exposed to contaminants, and the potential frequency and duration of the exposure. Using the information, EPA calculates a "reasonable maximum exposure" (RME) scenario, which portrays the highest level of human exposure that could reasonably be expected to occur.

In Step 3, EPA uses the information from Step 2 combined with information on the toxicity of each chemical to assess potential health risks. EPA considers two types of risk: cancer risk and non-cancer risk. The likelihood of any kind of cancer resulting from a Superfund Site is generally expressed as an upper bound of probability; for example a "1 in 10,000 chance". In other words, the exposed individual would have an excess cancer risk of one in 10,000 due to Site contaminants. This excess risk would be over and above the existing cancer risk for the individual. For non-cancer health effects, EPA calculates a "hazard index" (HI). The key concept here is that a "threshold level" (measured usually as a HI of less than 1) exists below which non-cancer health effects are not expected.

In Step 4, EPA determines whether Site risks are excessive for people at or near the Superfund Site. The results of the three previous steps are combined, evaluated, and summarized. EPA adds up the potential Risks for each receptor.

the screening level risk assessment that have not yet obtained acceptance by EPA and Florida DEP. Therefore, the Agency will utilize conservative default ecological endpoints in identification and selection of cleanup goals for remedial goal selection.

Remedial Action Objectives and Cleanup Levels

Remedial Action Objectives (RAOs) for the Site are based on potential migration or exposure pathways for Site COCs and applicable or relevant and appropriate requirements (ARARs) identified in the 2010 FS. The RAOs provide media-specific and action-specific requirements to protect human health and the environment. The RAOs identified for the Site include:

- Mitigate risks to potential receptors exposed to Site-related contaminants in:
  - Surface soils;
  - Groundwater in the Surficial Aquifer, Upper HG, Lower HG, and Upper Floridan Aquifer;
  - Subsurface soils;
  - Sediment; and
  - Surface water.
- Mitigate further migration of impacted groundwater.
- Restore quality of groundwater outside of source areas to beneficial use having COC concentrations no greater than Federal MCLs or Florida GCTLs.
- Reduce the mobility, volume, and toxicity of DNAPL to the extent practicable.

Cleanup goals for COCs are listed in Table 1. The selected cleanup goals are the Florida commercial/industrial SCTLs for on-Site soils/sediments and either the residential SCTLs or commercial/industrial SCTLs for off-Site soils/sediments based on the current land use. The selected goals for groundwater are the

Table 1 – Cleanup Goals for COCs

Groundwater (µg/L)		
naphthalene	14	Listed compounds exceed the federal MCL and/or Florida Default GCTL (based on values in effect on the date that the Proposed Plan was issued). * Primary standard as defined by Florida Department of Environmental Protection in F.A.C. 62-777.
acenaphthalene	210	
2-methylnaphthalene	28	
pentachlorophenol	1	
arsenic	10	
carbazole	1.8	
dibenzofuran	28	
1,1 biphenyl	0.5	
phenol	10	
2-phenol	*	
2-methylphenol	35	
2,4-dimethylphenol	140	
3/4-methylphenol	7	
acenaphthene	210	
benzo(a)anthracene	0.05	
benzo(a)pyrene	0.2	
benzo(b)fluoranthene	0.05	
benzo(k)fluoranthene	0.5	
chrysene	4.8	
bis(2-ethylhexyl) phthalate	*	
fluoranthene	280	
fluorene	280	
n-nitrosodiphenylamine	7.1	
phenanthrene	210	
benzene	1	
benzene	5	Federal MCL

On-Site Soil (0-2 feet bls)/Sediment (mg/kg)		
pcPAHs (BaP-TEQ)*	0.7	Florida default SCTLs for commercial/industrial land use and Florida default leachability SCTLs unless Site-specific leachability data are developed during remedial design. * Site concentrations for carcinogenic polycyclic aromatic hydrocarbons (pcPAHs) are converted to Benzo(a)pyrene equivalents (BaP-TEQ) before comparison with the cooresponding direct exposure SCTL for Benzo(a)pyrene (see the February 2005 "Final Technical Report Development of Cleanup Target Levels (CTLs) for Chapter 62-777 F.A.C."
dioxins (TCDD-TEQ)	0.00003	
antimony	27	
arsenic	2.1	
chromium (total)	470	
copper	89000	
lead	1400	
pentachlorophenol	28	
acenaphthene	2400	
naphthalene	300	
2-methylnaphthalene	2100	
fluoranthene	59000	
fluorine	33000	
phenanthrene	36000	
1,1 biphenyl	34000	
carbazole	240	
dibenzofuran	6300	
benzene	1.2	
2,4,5-trichlorophenol	130,000	
2,4-dimethylphenol	18000	
3/4-methylphenol	31000	

Table 1 – Cleanup Goals for COCs (Continued)

Off-Site Soil/Sediment (mg/kg)		
pcPAHs (BaP-TEQ)*	0.1	Florida default SCTLs residential land-use
dioxins (TCDD-TEQ)	0.000007	
arsenic	2.1	
pentachlorophenol	7.2	
pcPAHs (BaP-TEQ)*	0.7	Florida default SCTLs for commercial/ industrial land use (depends on specific land-use of off-Site location)
dioxins (TCDD-TEQ)	0.000003	
arsenic	12	
pentachlorophenol	28	
pentachlorophenol	0.03	Florida default leachability SCTLs for CW protection
pentachlorophenol	0.2	Florida default leachability SCTLs for protection of ecological organisms in surface water

federal MCLs or Florida GCTLs, if the latter are more stringent. In addition, Florida leachability criteria for soil are relevant and appropriate for protection of groundwater.

Considerable uncertainty surrounds the derivation of clean-up goals for dioxins and furans, including the development of site-specific risk-based goals, and Florida's default residential SCTL of 0.007 µg/kg. At present there is significant ongoing debate between and among researchers, different regulatory agencies, and the regulated community regarding the toxicity of dioxins/furans and whether meaningful human-health risks are posed by low concentrations of these contaminants, particularly with respect to concentrations in soils. Evidence of this ongoing debate can be observed in the numerous comments submitted to EPA in response to publication of the agency's Dioxin Science Plan, the proposed interim preliminary remediation goals (PRG) for dioxins, and the draft response to the National Academy of Science's review of the Dioxin Reassessment. Clean-up goals for dioxins/furans used by various state regulatory agencies and EPA vary over several orders of magnitude, with Florida's default SCTL being at the low end of the range. Florida's SCTLs will be used as the cleanup goal for dioxin-contaminated soil at the Site.

Remedial Alternatives

Remedial alternatives were defined and evaluated separately for three major environmental media units of the Site (on-Site media [excluding UFA groundwater], off-Site surface soil, and UFA groundwater). The final Site remedial alternative will consist of a set of three remedies: one for the on-Site media, one for the UFA, and one for the off-Site surface soil unit.

As part of the remedial design process which follows remedy selection, additional characterization of Site aquifers will be conducted to address remaining uncertainties related to DNAPL migration and, more importantly, refine its vertical and horizontal boundaries for effective remedy implementation. Off-Site soil characterization continues to the north, south, east, and west of the Site to completely delineate Site-related impacts and to expedite cleanup of off-Site areas. During the remedial design, an ambient air monitoring network will be installed at the Site. Since the Koppers Facility closure, Beazer East has begun interim measures to reduce dust including planting of vegetation over former operation areas. As part of Site building demolition activities, Beazer East is implementing dust control of continuous water application to suppress dust.

The following alternatives, developed and documented in the 2010 FS, must meet the threshold statutory requirements of protection of human health and the environment to address chemical-specific, location-specific, and action-specific Applicable or Relevant and Appropriate Requirements (ARARs).

On-Site Remedies

The on-Site remedial alternatives focus primarily on addressing impacted groundwater and sources of contaminants in the surface soil, Surficial Aquifer and Upper Hawthorn zones. Contaminant sources include residual DNAPL or contaminants adsorbed to soil particles.

Remedy Components Common to Multiple On-Site Alternatives

Many of the on-Site remedial alternatives contain remedy components that are common to multiple alternatives. A description of the common components is provided below.

- *Surface grading and covers* - This remedial component consists of re-grading much of the Site and using one or more types of surface covers to prevent potential direct exposure to surface soils. The covers will be designed to be impermeable where leachability and/or infiltration are a concern. The final surface cover design will be consistent with the expected future land use of the property.
- *Storm water rerouting and detention* – This remedy component will be implemented in concert with the designed surface grading and covers. Storm water controls will consist of: (a) grading and contouring the Site to direct runoff toward collection points; (b) installation of one or more detention/retention ponds; and (c) possible replacement of the existing Site storm water ditch with another ditch or with an engineered conveyance such as an underground concrete pipe (culvert).
- *Soil consolidation area with low-permeability cap/cover* - This remedy component consists of placing select soils in a designated on-Site consolidation area within the area encircled by a subsurface barrier wall. The soil placed within the consolidation area includes surface soil that is removed during Site grading and soil that is derived from construction of other remedy components. A low-permeability cap/cover will be constructed over the consolidation

area beneath the designed final surface cover.

- *On-Site ex-situ soil treatment* - This remedy component includes on-Site treatment of soils from source area excavation and/or resulting from ex-situ solidification/ stabilization implementation. It is assumed that soil will be treated by solidification/stabilization, although other treatment options (e.g., chemical oxidation, thermal treatment, biological treatment) may be evaluated during final design.
- *Barrier wall* - This remedy component consists of installing a cement/bentonite slurry wall to encircle all four primary source areas. The slurry wall will be approximately 5,000 feet in length and will extend vertically from land surface to the top of the HG middle clay, approximately 65 feet deep. Other types of vertical barriers (e.g., sheet pile, in-situ solidified soil columns, or injected grout) may be considered during final design based on geotechnical testing.
- *Surficial Aquifer hydraulic containment and groundwater monitoring* - This remedy component consists of operating the existing hydraulic containment system including the perimeter wells and the horizontal groundwater collection drains at the base of the Surficial Aquifer near the four source areas. Periodic adjustments to operations will be made as necessary to optimize containment and treatment reliability.
- *In-situ solidification/stabilization (ISS/S) of source areas* – This remedy component consists of applying additives, such as cement, lime, fly ash, or polymers, to bind with the soil particles to reduce the mobility of the contaminants. S/S agents can be applied in-situ with auger drilling/mixing equipment. Inclusion of ISS/S as a remedy component includes one or more pilot studies with performance criteria to provide an effective mix design
- *In-situ biogeochemical stabilization (ISBS) of source areas* – This remedy component consists of injecting a buffered solution of sodium permanganate and catalysts into the target zone in order to: (1) chemically oxidize organic COCs; (2) form a geochemical solid through the action of the reagent and the organic COCs; and (3) reduce the flux of COCs from residual DNAPL into the aqueous phase by reducing aquifer transmissivity. Inclusion of ISBS as a remedy component includes one or more pilot studies with performance criteria designed to demonstrate and optimize effectiveness as a remedy component. If this technology does not meet its designated performance criteria, ISS/S would be implemented instead.
- *Manual DNAPL recovery* - This remedy component involves continuation of the current program of bi-weekly DNAPL bailing from Upper Hawthorn monitor wells HG-11S, HG-15S, HG-12S, HG-10S, and HG-16S. This activity will continue as long as DNAPL is recoverable in these wells.
- *Chemical Oxidation (ChemOx)/ISBS using existing HG wells* - This remedy component involves use of existing HG monitor wells as treatment-injection points for either ChemOx or ISBS based on contaminant concentrations and pilot study results.
- *HG groundwater monitoring* - This remedy component includes monitoring of Upper Hawthorn and Lower Hawthorn groundwater using existing and new wells. The monitoring will be used to demonstrate remedy performance and provide sentinel monitoring locations for contingent actions.
- *Contingent actions in the HG* - This remedy component includes contingent remedial actions for groundwater in the HG if monitoring results indicate that contaminant concentrations are either above GCTLs and increasing (at sentinel wells where Site contaminants have been detected) or begin to be detected above GCTLs at previously clean sentinel wells. The expected contingent action for organic contaminants is ChemOx using a permanganate solution.

ChemOx is used to chemically transform organic COCs into non-toxic or immobile substances.
- *Monitored natural attenuation (MNA)* - This remedy component relies on naturally occurring geophysical and geochemical processes that act on COCs to make them less toxic/hazardous or less mobile. Monitoring results are used to demonstrate that these processes are occurring in the subsurface at the Site. Inclusion of MNA as a remedy component requires that additional evaluation will be performed to demonstrate active natural attenuation. This evaluation will be coordinated with any other groundwater remedy components (e.g., hydraulic containment) to distinguish the effects of MNA from other groundwater remedy technologies.
- *Institutional controls* - This on-Site remedy component consists of deed restrictions and other administrative actions to limit and control potential exposure to media with elevated contaminant concentrations and to ensure the effectiveness of engineering controls.

OnR-1: No Action
Total Net Present Value: $ minimal
Estimated Construction Timeframe: None
Estimated Time to Achieve RAOs: > 100 years
ARARs: Does not attain.

Regulations governing the Superfund program require the "No Action" alternative to be considered. The No Action alternative is used as a baseline to compare with other alternatives. Under the No Action alternative, all active and Manual Site activities, including groundwater extraction, DNAPL collection and groundwater monitoring, would cease. Furthermore, there would be no deed restrictions or Site security controls to prevent use of Site groundwater, limit exposures to Site soil, or restrict certain kinds of future development. This alternative is retained as a basis for comparison of risk reduction using remediation technologies and does not meet the threshold criteria necessary for a viable alternative.

OnR-2: Continue Current Actions with Surface Grading/Covers
Estimated Capital Cost: $6.2M
Approximate Annual OM&M: $ 300,000
Total Net Present Value: $ 11.1M
Estimated Construction Timeframe: < 1 year
Estimated Time to Achieve RAOs: many years
ARARs: action-specific and location-specific ARARs are met with this alternative. The remedy may not attain all chemical-specific ARARs within a reasonable time.

This alternative includes continuing the current interim remedial measures: Surficial Aquifer groundwater extraction/treatment, groundwater monitoring and Manual DNAPL recovery. The remedy also includes regrading and covering most of the Site. As a contingency action, ChemOx would be injected if necessary to remediate groundwater impacted principal threat materials in the HG. MNA and institutional controls are also part of this alternative.

This alternative includes the following primary components:
- Grading of Site soil and installation of soil covers and storm water controls;
- Continued operation of the Surficial Aquifer extraction and treatment system;
- Expansion of the Surficial Aquifer and HG monitoring network for: (1) establishment of monitoring points; (2) demonstration of active natural attenuation processes; and (3) establishment of trigger locations for contingency measures;
- Continuation of Manual DNAPL recovery in the Upper Hawthorn; and
- Institutional controls to mitigate risks from exposure to Site soil, sediment, surface water, or groundwater.

OnR-3A: Removal – Surficial Aquifer Excavation

Estimated Capital Cost: $ 64.1M
Approximate Annual OM&M: $ 165,000
Total Net Present Value: $ 67.8M
Estimated Construction Timeframe: 2 years
Estimated Time to Achieve RAOs: several years
ARARs: Chemical-specific, action-specific and location-specific ARARs are all met with this alternative

This alternative includes excavating the Surficial Aquifer material in the four source areas (to approximately 25 feet below surface), treating the excavated soil by ex-situ solidification/stabilization, returning most of this material to the excavations, and incorporating excess solidified material into covers for the excavated areas. Vertical retaining/barrier walls will be installed to the top of the middle clay unit of the HG to provide shoring for the excavations and to contain groundwater impacts in the Upper Hawthorn. ChemOx or ISBS (catalyzed sodium permanganate) treatment will be applied at existing Upper and Lower HG wells in source areas. As a contingency, ChemOx will be injected if necessary to remediate potential groundwater impacts in the HG. The ChemOx and ISBS components of this remedy will be implemented only if treatability studies demonstrate successful contaminant treatment and containment.

This alternative includes the following components:

- Excavation of source areas to the HG upper clay;
- Installation of an encircling vertical retaining/barrier wall around each source area to the HG middle clay;
- ChemOx or ISBS treatment applied at existing Upper and Lower Hawthorn wells in source areas (based on acceptable performance during pilot tests or treatability studies);
- On-Site treatment of excavated soil (solidification/stabilization or alternate material management options);
- Return of treated soil to the excavated areas with use of excess treated soil as a base layer in cover design;
- Surface grading and covering for most of the Site with installation of storm water controls;
- Continued operation of the Surficial Aquifer extraction and treatment system to verify remedy effectiveness in reducing contaminant flux, then shutdown of this system;
- Expansion of the Surficial Aquifer and HG monitoring network for: (1) establishment of sentinel locations; (2) demonstration of active natural attenuation processes; and (3) establishment of trigger locations for contingency measures; and
- Institutional controls to mitigate risks from exposure to Site soil, sediment, surface water or groundwater.

OnR-3B: Removal – Excavation to Middle Clay

Estimated Capital Cost: $ 190M
Approximate Annual OM&M: $ 165,000
Total Net Present Value: $ 193.7M
Estimated Construction Timeframe: 3.5 years
Estimated Time to Achieve RAOs: several years
ARARs: Chemical-specific, action-specific and location-specific ARARs are all met with this alternative

This alternative includes excavating the Surficial Aquifer material in the four source areas and in the Upper HG above the middle clay unit (approximately 65 feet below surface), treating the excavated soil by ex-situ solidification/stabilization, returning most of this material to the excavations, and incorporating excess solidified material into covers for the excavated areas. ChemOx or ISBS treatment will be applied at existing Lower HG wells in source areas. As a contingency, ChemOx will be injected if necessary to remediate groundwater impacts in the HG.

This alternative includes the following components:

- Excavation of source areas to the HG middle clay with 2:1 side-slopes and vertical shoring where necessary;
- On-Site treatment of excavated soil (solidification/stabilization or alternate material management options);
- Return of treated soil to the excavated areas with use of excess treated soil as a base layer in cover design;
- Surface grading and covering for most of the Site with installation of storm water controls;
- Continued operation of the Surficial Aquifer extraction and treatment system for a period of time, then shutdown of this system (source area horizontal collection drains are abandoned);
- ChemOx or ISBS treatment applied at existing Lower HG wells in source areas (based on performance during pilot tests or treatability studies);
- Expansion of the Surficial Aquifer and HG monitoring network for: (1) establishment of sentinel locations; (2) demonstration of active natural attenuation processes, and; (3) establishment of trigger locations for contingency measures; and
- Institutional controls to mitigate risks from exposure to Site soil, sediment, surface water or groundwater.

OnR-4A: In-Situ Treatment – Solidification/ Stabilization to Middle Clay
Estimated Capital Cost: $ 72.5M
Approximate Annual OM&M: $ 165,000
Total Net Present Value: $ 78.9M
Estimated Construction Timeframe: 3 years
Estimated Time to Achieve RAOs: several years
ARARs: Chemical-specific, action-specific and location-specific ARARs met with this alternative.

This alternative includes in-situ solidification/ stabilization (ISS/S) of impacted soil from the ground surface to the top of the middle clay unit of the HG (approximately 65 feet below ground surface) in the four source areas. Excess soil will be treated by ex-situ solidification/ stabilization and used as a base layer for surface covers. ChemOx or ISBS treatment will be applied at existing Lower HG wells in source areas. As a contingency, ChemOx will be injected if necessary to remediate groundwater impacts in the HG.

This alternative includes the following components:

- ISS/S to the middle clay unit of the HG in the four source areas;
- ChemOx or ISBS treatment applied at existing Lower HG wells in source areas (based on performance during pilot tests or treatability studies);
- Ex-situ S/S of excess soil for use as a base layer in cover design;
- Surface grading and covering for most of the Site with installation of storm water controls;
- Continued operation of the Surficial Aquifer extraction and treatment system until such time as cleanup goals are consistently and continually met, then shutdown of this system;
- Expansion of the Surficial Aquifer and HG monitoring network for: (1) establishment of sentinel locations, (2) demonstration of active natural attenuation processes; and (3) establishment of trigger locations for contingency measures; and
- Institutional controls to mitigate risks from exposure to Site soil, sediment, surface water or groundwater.

OnR-4B: In-Situ Treatment - Solidification/ Stabilization and Biogeochemical Stabilization
Estimated Capital Cost: $ 38.1M
Approximate Annual OM&M: $ 165,000
Total Net Present Value: $ 41.8M

Estimated Construction Timeframe: 2.5 years
Estimated Time to Achieve RAOs: several years
ARARs: chemical-specific, action-specific and location-specific ARARs met with this alternative.

This alternative includes ISS/S of impacted soil from ground surface to the top of the upper clay unit of the HG (approximately 25 feet below ground surface) in the four source areas. Excess soil will be treated by ex-situ solidification/ stabilization and used as a base layer for surface covers. ISBS will be injected in Upper HG in source areas. ChemOx or ISBS treatment will be applied at existing Lower HG wells in source areas. As a contingency, ChemOx will be injected if necessary to remediate groundwater impacts in the HG. This remedy is similar to remedy OnR-4A except that ISBS replaces ISS/S in the Upper Hawthorn.

This alternative includes the following components:

- ISS/S to the upper clay unit of the HG in the four source areas;
- ISBS in the Upper HG below the ISS/S treatment zones (subject to acceptable performance during pilot tests or treatability studies);
- ChemOx or ISBS treatment applied at existing Lower HG wells in source areas (based on performance during pilot tests or treatability studies);
- Ex-situ S/S of excess soil for use as a base layer in cover design;
- Surface grading and covering for most of the Site with installation of storm water controls;
- Continued operation of the Surficial Aquifer extraction and treatment system until such time as cleanup goals are consistently and continually met, then shutdown of this system;
- Expansion of the Surficial Aquifer and HG monitoring network for: (1) establishment of sentinel locations, (2) demonstration of active natural attenuation processes; and (3) establishment of trigger locations for contingency measures; and
- Institutional controls to mitigate risks from exposure to Site soil, sediment, surface water or groundwater.

OnR-5A: Containment/Treatment – Barrier Wall
Estimated Capital Cost: $ 12.8M
Approximate Annual OM&M: $ 181,000
Total Net Present Value: $ 16.0M
Estimated Construction Timeframe: 1 year
Estimated Time to Achieve RAOs: several years
ARARs: chemical-specific, action-specific and location-specific ARARs met with this alternative.

This alternative is a combination of containment and treatment remedies and includes installing a barrier wall around the DNAPL source areas to the top of the middle clay unit of the HG. Soil removed during the slurry wall installation will be used as fill in the soil consolidation area. ChemOx or ISBS treatment will be applied at existing Lower Hawthorn wells in source areas.

The barrier wall will limit groundwater inflow to, and outflow from, DNAPL-impacted areas. A capped soil-consolidation area will be established inside the barrier-wall for soil excavated during on- or off-Site remedy construction and/or regrading. Outside the barrier wall, surface regrading and covers will eliminate potential exposure to soil with contaminant concentrations exceeding cleanup goals. Manual DNAPL recovery will continue at five source area wells in the Upper Hawthorn and operation of a modified version of the Surficial Aquifer groundwater extraction system will continue until it is no longer needed.

This alternative includes the following components:

- A single encircling vertical barrier wall around all four source areas to the HG middle clay;

- ChemOx or ISBS treatment applied at existing Lower HG wells in source areas (based on performance during pilot tests or treatability studies);
- Establishment of a capped soil-consolidation area;
- Surface grading and covering for most of the Site with installation of storm water controls;
- Continued operation of the northern perimeter wells of the Surficial Aquifer extraction and treatment system until such time as cleanup goals are consistently and continually met, then shutdown of these wells;
- Continued operation of the horizontal collection drains of the Surficial Aquifer extraction and treatment system as needed for hydraulic control;
- Expansion of the Surficial Aquifer and HG monitoring network to: (1) establish sentinel locations; (2) demonstrate active natural attenuation, and (3) establish trigger locations for contingency measures;
- Continued Manual DNAPL recovery at wells HG-16S, HG-10S, HG-12S, HG-15S, and HG-11S; and
- Institutional controls to mitigate risks from exposure to Site soil, sediment, surface water or groundwater.

OnR-5B: Containment/Treatment –Barrier Wall plus In Situ Biogeochemical Stabilization in the Upper Hawthorn
Estimated Capital Cost: $ 18.0*M*
Approximate Annual OM&M: $ 165,000
Total Net Present Value: $ 20.9M
Estimated Construction Timeframe: 16 months
Estimated Time to Achieve RAOs: several years
ARAR: chemical-specific, action-specific and location-specific ARARs met with this alternative.

This alternative is a combination of containment and treatment remedies and includes installing a barrier wall around the DNAPL source areas to the top of the middle clay unit of the HG and ISBS treatment at the base of the Upper HG. Excess soil will be used as fill in the soil consolidation area. ChemOx or ISBS treatment will be applied at existing Lower HG wells in source areas. As a contingency, ChemOx will be injected if necessary to remediate groundwater impacts in the HG. .

The barrier wall will limit groundwater inflow to (and outflow from) DNAPL-impacted areas. A capped soil-consolidation area will be established inside the barrier-wall for excavated soil. Outside the barrier wall, surface regrading and covers will eliminate potential exposure to soil above cleanup goals. ISBS injections will be placed into the Upper HG (subject to acceptable performance during pilot tests or treatability studies) to treat DNAPL and reduce COC mobility. Operation of a modified version of the Surficial Aquifer groundwater extraction system will continue until it is no longer needed.

This alternative includes the following components:

- A single encircling vertical barrier wall around all four source areas to the HG middle clay;
- Establishment of a capped soil-consolidation area;
- ISBS in the Upper HG at each source area (subject to acceptable performance during pilot tests or treatability studies);
- ChemOx or ISBS treatment applied at existing Lower HG wells in source areas (based on acceptable performance during pilot tests or treatability studies);
- Surface grading and covering for most of the Site with installation of storm water controls;
- Continued operation of the northern perimeter wells of the Surficial Aquifer extraction and treatment system until such time as cleanup goals are consistently and continually met, then shutdown of these wells;
- Continued operation of the horizontal collection drains of the Surficial Aquifer

extraction and treatment system as needed for hydraulic control;
- Expansion of the Surficial Aquifer and HG monitoring network for (1) establishment of sentinel locations, (2) demonstration of active natural attenuation, and (3) establishment of trigger locations for contingency measures;
- Institutional controls to mitigate risks from exposure to Site soil, sediment, surface water or groundwater.

OnR-5C: Containment/Treatment – Barrier Wall plus In Situ Biogeochemical Stabilization in the Surficial Aquifer
Capital Cost and Contingency: $ 18.1M
Annual O&M: $ 181,000
Total Present Worth: $ 21.3M
Estimated Construction Timeframe: 16 months
Estimated Time to Achieve RAOs: several years
ARARs: chemical-specific, action-specific and location-specific ARARs met with this alternative.

This alternative is a combination of containment and treatment remedies and includes installing a barrier wall around the DNAPL source areas to the top of the middle clay unit of the HG and ISBS treatment of the Surficial Aquifer in source areas. The excess soil will be used as fill in the soil consolidation area. ChemOx or ISBS treatment will be applied at existing Lower HG wells in source areas. As a contingency, ChemOx will be injected if necessary to remediate groundwater impacts in the HG.

The barrier wall will limit groundwater inflow to, and outflow from, DNAPL-impacted areas. A capped soil-consolidation area will be established inside the barrier-wall extents for excavated soil. Outside the barrier wall, surface regrading and covers will eliminate potential exposure to soil with contaminant concentrations above cleanup goals. ISBS injections will be placed into the Surficial Aquifer (based on acceptable performance during pilot tests or treatability studies) to treat DNAPL and reduce COC mobility. Operation of a modified version of the Surficial Aquifer groundwater extraction system will continue until it is no longer needed. Note that the only difference between Alternatives OnR-5B and OnR-5C is the depth of the ISBS treatment. This alternative includes the following components:

- A single encircling vertical barrier wall around all four source areas to the HG middle clay;
- Establishment of a capped soil-consolidation area;
- ISBS in the Surficial Aquifer at each source area (subject to acceptable performance during pilot tests or treatability studies);
- ChemOx or ISBS treatment applied at existing Lower HG wells in source areas (based on acceptable performance during pilot tests or treatability studies);
- Surface grading and covering for most of the Site with installation of storm water controls;
- Continued operation of the northern perimeter wells of the Surficial Aquifer extraction and treatment system until such time as cleanup goals are consistently and continually met, then shutdown of these wells;
- Continued operation of the horizontal collection drains of the Surficial Aquifer extraction and treatment system as needed for hydraulic control;
- Expansion of the Surficial Aquifer and HG monitoring network for: (1) establishment of sentinel locations; (2) demonstration of active natural attenuation processes; and (3) establishment of trigger locations for contingency measures;
- Continued Manual DNAPL recovery at wells HG-16S, HG-10S, HG-12S, HG-15S, and HG-11S; and
- Institutional controls to mitigate risks from exposure to Site soil, sediment, surface water or groundwater.

OnR-5D: Containment/Treatment – Barrier Wall plus In Situ Solidification/ Stabilization in the Surficial Aquifer
Capital Cost and Contingency: $ 35.7M
Annual O&M: $ 165,000
Total Present Worth: $ 38.7M
Estimated Construction Timeframe: 2.5 years
Estimated Time to Achieve RAOs: several years
ARARs: chemical-specific, action-specific and location-specific ARARs met with this alternative.

This alternative is a combination of containment and treatment technologies and includes installing a barrier wall around the DNAPL source areas to the top of the middle clay unit of the HG and ISS/S treatment of the Surficial Aquifer. Excess soil will be used as fill in the soil consolidation area. ChemOx or ISBS treatment will be applied at existing Upper and Lower HG wells in source areas. As a contingency, ChemOx will be injected if necessary to remediate groundwater impacts in the HG.

The barrier wall will limit groundwater inflow to, and outflow from, DNAPL-impacted areas. A capped soil-consolidation area will be established inside the barrier-wall extents for excavated soil and excess soil from ISS/S implementation. Outside the barrier wall, surface regrading and covers will eliminate potential exposure to soil with contaminant concentrations that result in estimated potential risks that exceed applicable risk limits. ISS/S mixing will take place in the Surficial Aquifer to treat DNAPL and reduce COC mobility. Operation of a modified version of the Surficial Aquifer groundwater extraction system will continue until it is no longer needed.

This alternative includes the following components:

- A single encircling vertical barrier wall around all four source areas to the HG middle clay;
- ISS/S to the upper clay unit of the HG in the four source areas;
- ChemOx or ISBS treatment applied at existing Upper and Lower HG wells in source areas;
- Establishment of a capped soil-consolidation area;
- Surface grading and covering for most of the Site with installation of storm water controls;
- Continued operation of the northern perimeter wells of the Surficial Aquifer extraction and treatment system until such time as cleanup goals are consistently and continually met, then shutdown of these wells;
- Continued operation of the horizontal collection drains of the Surficial Aquifer extraction and treatment system as needed for hydraulic control;
- Expansion of the Surficial Aquifer and HG monitoring network for: (1) establishment of sentinel locations,;(2) demonstration of active natural attenuation processes; and (3) establishment of trigger locations for contingency measures; and
- Institutional controls to mitigate risks from exposure to Site soil, sediment, surface water or groundwater.

OnR-5E: Containment/Treatment – Barrier Wall plus In Situ Biogeochemical Stabilization in the Surficial Aquifer and Upper Hawthorn
Capital Cost and Contingency: $ 26.1M
Annual O&M: $ 165,000
Total Present Worth: $ 29.1M
Estimated Construction Timeframe: 2 years
Estimated Time to Achieve RAOs: several years
ARARs: chemical-specific, action-specific and location-specific ARARs met with this alternative.

This alternative is a combination of containment and treatment technologies and includes installing a barrier wall around the DNAPL source areas to the top of the middle clay unit of the HG and ISBS treatment of the Surficial Aquifer and Upper Hawthorn in source areas. Excess soil will be used as fill in the soil consolidation area. ChemOx or ISBS treatment will be applied at existing Lower Hawthorn wells in source areas. As a contingency, ChemOx will be injected if necessary to remediate groundwater impacts in the HG.

The barrier wall will limit groundwater inflow to, and outflow from, DNAPL-impacted areas. A capped soil-consolidation area will be established inside the barrier-wall for excavated soil. Outside the barrier wall, surface regrading and covers will eliminate potential exposure to soil with contaminant concentrations above cleanup goals. ISBS injections will be placed into the Surficial Aquifer and Upper HG (subject to acceptable performance during pilot tests or treatability studies) to treat DNAPL and reduce COC mobility. Operation of a modified version of the Surficial Aquifer groundwater extraction system will continue until it is no longer needed. Note that the only difference between OnR-5E and remedies OnR-5B and OnR-5C is the depth of the ISBS treatment.

This alternative includes the following components:

- A single encircling vertical barrier wall around all four source areas to the HG middle clay;
- Establishment of a capped soil-consolidation area;
- ISBS in the Surficial Aquifer and Upper Hawthorn at each source area (based on performance during pilot tests or treatability studies);
- ChemOx or ISBS treatment applied at existing Lower Hawthorn wells in source areas (based on acceptable performance during pilot tests or treatability studies);
- Surface grading and covering for most of the Site with installation of storm water controls;
- Continued operation of the northern perimeter wells of the Surficial Aquifer extraction and treatment system until such time as cleanup goals are consistently and continually met, then shutdown of these wells;
- Continued operation of the horizontal collection drains of the Surficial Aquifer extraction and treatment system as needed for hydraulic control;
- Expansion of the Surficial Aquifer and HG monitoring network for: (1) establishment of sentinel locations; (2) demonstration of active natural attenuation processes; and (3) establishment of trigger locations for contingency measures;
- Institutional controls to mitigate risks from exposure to Site soil, sediment, surface water or groundwater.

OnR-5F: Containment/Treatment – Barrier Wall plus In Situ Solidification/Stabilization in the Surficial Aquifer and Upper Hawthorn
Capital Cost and Contingency: $ 71.8M
Annual O&M: $ 165,000
Total Present Worth: $ 74.8M
Estimated Construction Timeframe: 3 years
Estimated Time to Achieve RAOs: several years
ARARs: chemical-specific, action-specific and location-specific ARARs met with this alternative.

This alternative is a combination of containment and treatment technologies and includes installing a barrier wall around the DNAPL source areas to the top of the middle clay unit of the HG and ISS/S treatment of the Surficial Aquifer and Upper Hawthorn. Excess soil will be used as fill in the soil consolidation area. ChemOx or ISBS treatment will be applied at existing Lower Hawthorn wells in source areas. As a contingency, ChemOx will be injected if necessary to remediate groundwater impacts in the HG.

The barrier wall will limit groundwater inflow to, and outflow from, DNAPL-impacted areas. A capped soil-consolidation area will be established inside the barrier-wall for excavated soil and excess soil from ISS/S implementation. Outside the barrier wall, surface regrading and covers will eliminate potential exposure to soil with contaminant concentrations above cleanup goals. ISS/S mixing will take place in the Surficial Aquifer and Upper HG to treat DNAPL and reduce COC mobility. Operation of a modified version of the Surficial Aquifer groundwater extraction system will continue until it is no longer needed.

This alternative includes the following components:

- A single encircling vertical barrier wall around all four source areas to the HG middle clay;
- ISS/S to the middle clay unit of the HG in the four source areas;
- ChemOx or ISBS treatment applied at existing Lower Hawthorn wells in source areas (based on performance during pilot tests or treatability studies);
- Establishment of a capped soil-consolidation area;
- Surface grading and covering for most of the Site with installation of storm water controls;
- Continued operation of the northern perimeter wells of the Surficial Aquifer extraction and treatment system until such time as cleanup goals are consistently and continually met, then shutdown of these wells;
- Continued operation of the horizontal collection drains of the Surficial Aquifer extraction and treatment system as needed for hydraulic control;
- Expansion of the Surficial Aquifer and HG monitoring network for: (1) establishment of sentinel locations; (2) demonstration of active natural attenuation processes; and (3) establishment of trigger locations for contingency measures; and
- Institutional controls to mitigate risks from exposure to Site soil, sediment, surface water or groundwater.

OnR-5G: Containment/Treatment – Barrier Wall plus In Situ Solidification/Stabilization in the Surficial Aquifer and In Situ Biogeochemical Stabilization in the Upper Hawthorn

Capital Cost and Contingency: $ 40.7M
Annual O&M: $ 165,000
Total Present Worth: $ 43.6M
Estimated Construction Timeframe: 3 years
Estimated Time to Achieve RAOs: several years
ARARs: chemical-specific, action-specific and location-specific ARARs met with this alternative.

This alternative is a combination of containment and treatment technologies and includes installing a barrier wall around the DNAPL source areas to the top of the middle clay unit of the HG, ISS/S treatment of the Surficial Aquifer, and ISBS treatment of the Upper Hawthorn. Excess soil will be used as fill in the soil consolidation area. ChemOx or ISBS treatment will be applied at existing Lower Hawthorn wells in source areas. As a contingency, ChemOx will be injected if necessary to remediate groundwater impacts in the HG.

The barrier wall will limit groundwater inflow to, and outflow from, DNAPL-impacted areas. A capped soil-consolidation area will be established inside the barrier-wall extents for excavated soil and excess soil from ISS/S implementation. Outside the barrier wall, surface regrading and covers will eliminate potential exposure to soil with contaminant concentrations that result in estimated potential risks that exceed applicable risk limits. ISS/S mixing will take place in the Surficial Aquifer to treat DNAPL and reduce COC mobility. ISBS injections will be placed into the Upper HG (subject to acceptable performance during pilot tests or treatability studies) in source areas to treat mass in that unit and create a barrier to vertical flow. The combination of ISS/S and ISBS is similar to alternative OnR-4B.

Operation of a modified version of the Surficial Aquifer groundwater extraction system will continue until it is no longer needed.

This alternative includes the following components:

- A single encircling vertical barrier wall around all four source areas to the HG middle clay;
- ISS/S to the upper clay unit of the HG in the four source areas;
- ISBS in the Upper HG in the four source areas (below the treated ISS/S soil) (subject to acceptable performance during pilot tests or treatability studies);
- ChemOx or ISBS treatment applied at existing Lower HG wells in source areas (subject to acceptable performance during pilot tests or treatability studies);
- Establishment of a capped soil-consolidation area;
- Surface grading and covering for most of the Site with installation of storm water controls;
- Continued operation of the northern perimeter wells of the Surficial Aquifer extraction and treatment system for a period of time, then shutdown of these wells;
- Continued operation of the horizontal collection drains of the Surficial Aquifer extraction and treatment system as needed for hydraulic control;
- Expansion of the Surficial Aquifer and HG monitoring network for (1) establishment of sentinel locations, (2) demonstration of active natural attenuation processes, and (3) establishment of trigger locations for contingency measures; and
- Institutional controls to mitigate risks from exposure to Site soil, sediment, surface water or groundwater.

Upper Floridan Aquifer Remedies

The potential risk associated with impacted UFA groundwater is addressed by disrupting the linkage between contaminant, transport pathway, and receptor. Removing any one of the three elements eliminates the potential exposure pathway and achieves the goal of mitigating the environmental hazard. The other goal required by CERCLA is restoration of the resource to the maximum extent practicable within a reasonable timeframe. Two viable approaches meet these goals:

- Treating UFA groundwater in-situ or ex-situ.
- Removing the groundwater migration pathway. Currently, the potential migration pathways from the Surficial Aquifer to the UFA are not known definitively.

The most viable strategy for addressing the UFA groundwater impacts is in-situ treatment (including natural attenuation processes) or ex-situ treatment of groundwater with elevated levels of contaminants.

Sentinel wells will be established in the UFA to ensure that groundwater concentrations do not exceed Federal drinking-water standards at points outside of areas where waste is managed in place (e.g. outside the vertical barrier containment zone).

UFA-1: No Action
Total Net Present Value: $ minimal
Estimated Construction Timeframe: None
Estimated Time to Achieve RAOs: > 100 years
ARARs: None.

Regulations governing the Superfund program generally require the "No Action" alternative be considered. The No Action alternative is used as a baseline to compare other alternatives. Under the No Action alternative, the existing groundwater monitoring in the UFA would cease. There would be no restrictions on groundwater use, and no monitoring would be performed to evaluate whether contaminant concentrations above the cleanup goals were migrating beyond the containment area. This alternative is retained as a basis for comparison of risk reduction using remediation technologies.

UFA-2: Hydraulic Containment supplemented by Institutional Controls and Monitored Natural Attenuation
Annual O&M: $ 100,000
Total Present Worth: $ 1.5M
Estimated Construction Timeframe: < 1 year
Estimated Time to Achieve RAOs: many years
ARARs: chemical-specific, action-specific and location-specific ARARs met with this alternative.

This remedy consists of a combination of two technologies: (1) targeted groundwater extraction for groundwater containing higher and more persistent contaminant concentrations; and (2) institutional controls and natural attenuation (for relatively low and isolated concentrations exceeding GCTLs or the MCL [benzene only]). Furthermore, if contaminant concentrations in UFA groundwater reach pertinent action levels, additional in situ remedy actions will be initiated.

This alternative includes the following components:

- Continuation of quarterly collection of groundwater samples from monitor wells, and analysis of samples for Site-related organic contaminants;
- Continuation/expansion of the UFA groundwater extraction/ex-situ treatment system, initially using existing wells FW-6 and FW-21B, along with the recently-installed extraction well FW-31BE (near FW-22B);
- As needed, installation of additional high capacity groundwater extraction wells for inclusion in the UFA groundwater extraction/ex-situ treatment system to establish/maintain containment; and
- Institutional controls to prevent UFA groundwater extraction for potable use at the Site or anywhere where cleanup goals for Site-related contaminants are exceeded.
- Evaluation and demonstration of natural attenuation processes occurring in the UF aquifer, in support of active remedial action.
- Additional in situ remedial actions if the primary remedy components (i.e., hydraulic containment, institutional controls, and supplemental MNA) do not adequately address contamination in the UF aquifer.

Off-Site Remedies

Off-Site Soils posing an unacceptable risk will be addressed by removing potentially complete exposure pathways. Removing one of the links in the exposure pathway chain mitigates the environmental hazard. To achieve the remedial action objectives, any of the following could be done to disrupt the potential exposure pathway:

1. Treating contaminants in surface soil in-situ or ex-situ.
2. Covering impacted soil in place with an engineered cover or preventing activities that may result in exposure through an engineered control, such as a fence.
3. Change land use to prevent contact with impacted soil.

All of these possible strategies are potentially practical approaches for certain off-Site areas, depending on land use, property-owner preferences, and estimated potential risks. Land use surrounding the Site consists of both residential and commercial properties. Florida risk-based corrective action (RBCA) standards allow for a combination of approaches for eliminating potential exposures to contaminants in off-Site soils.

The total area and volume of off-Site surface soil requiring remediation is still being determined through ongoing sampling. Therefore, the descriptions of off-Site remedies are conceptual in nature, allowing flexibility in the actual extent of properties to be remediated.

For areas identified requiring remediation, each affected private property owner will be contacted by the PRP to discuss the best approaches to address the soil impacts on their private property.

OfR-1: No Action

Total Net Present Value: $ minimal
Estimated Construction Timeframe: None
Estimated Time to Achieve RAOs: > 100 years
ARAR: None.

Regulations governing the Superfund program generally require the "No Action" alternative be considered. The No Action alternative is used as a baseline to compare other alternatives. Under the No Action alternative, there would be no restrictions on land-use in the residential area west of the facility, and no actions would be implemented to mitigate contaminant concentrations in the soil. This alternative is included as a baseline to evaluate other alternatives. Since the alternative does not address the risks posed by the soil, it is not a viable option.

OfR-2: Remove Impacted Soil

Cost and Timeframe: Since soil volume and the specific approach chosen by property owners are unknown at this time, cost and remediation timeframe for this alternative are unknown. This portion of the overall Site remedy is being expedited.
ARARs: chemical-specific and location-specific ARARs are met with this alternative.

This remedy consists of excavating the surface soil in areas surrounding the Site determined to exceed Florida's allowable risk limit or the default SCTLs and replacement with clean fill; and revegetation.

Excavated soil may be addressed in one of three ways: (1) excavated soil may be transported off-Site to a permitted disposal facility; (2) excavated soil may be consolidated with on-Site soil and covered under the engineered cover within the facility property; and (3) excavated soil may be used as raw material for constructing the on-Site engineered surface cap.

OfR-3: Institutional and Engineering Controls

Cost and Timeframe: Since soil volume and the specific approach chosen by property owners are unknown at this time, cost and remediation timeframe for this alternative are unknown. This portion of the overall Site remedy is being expedited.
ARARs: chemical-specific, action-specific, and location-specific ARARs are met with this alternative.

This remedy includes administrative and/or engineering actions intended to prevent exposure to impacted soil. Both institutional and engineering controls would be applied in a way that reduces or eliminates exposure to surface soil in the affected area.

The components of this remedy are (1) institutional controls designed to prevent people from using or disturbing soil posing potentially unacceptable risk and (2) engineering controls to prevent receptors from potentially contacting impacted soil.

OfR-4: Removal, Institutional Controls, and/or Engineering Controls (Hybrid)

Cost and Timeframe: Since soil volume and the specific approach chosen by property owners are unknown at this time, cost and remediation timeframe for this alternative are unknown. This portion of the overall Site remedy is being expedited.
ARARs: chemical-specific, action-specific, and location-specific ARARs are met with this alternative.

This remedy consists of a combination of targeted soil excavation and application of engineering and administrative controls. The distinction between soil to be excavated and soil to be addressed by institutional and engineering controls will be based on contaminant concentration(s), and parcel land use (present and future). This strategy allows maximum flexibility in applying excavation or controls to soils that do not meet Florida's allowable risk ($1X10^{-6}$) or default SCTLs.

The components of this remedy include (1) excavation of surface soil, (2) institutional controls on properties and areas not excavated, and/or (3) engineering controls that act as physical barriers to contacting impacted soil.

Alternative Evaluation

Superfund's nine criteria are used to evaluate different remediation alternatives individually and against one another in order to select a remedy. This section of the Plan profiles the relative performance of each alternative against the nine criteria, noting how it compares to other options under consideration. The nine evaluation criteria are discussed below. To be retained as a viable alternative, the two threshold criteria must be met. Alternatives were evaluated by the degree and certainty to which the criteria are met through assessment of specific objectives for each of the first four balancing criteria. Finally, the two modifying criteria of State and community acceptance are being evaluated through the public involvement of this Proposed Plan. A detailed analysis of alternatives, as well as information about the evaluation process can be found in the FS.

On-Site Alternative Evaluation

1 and 2. Protection of Human Health and the Environment and Compliance with Statutory Requirements

The two threshold CERCLA criteria are: Protection of Human Health and the Environment and Compliance with ARARs.

Nine of the ten on-Site alternatives are expected to meet the two threshold CERCLA criteria. Only the No-Action Alternative (Alternative SWA-1) would fail to meet these mandatory criteria. The other nine alternatives (Alternative SWA-2 through Alternative SWA-5D) are compared using four of the five primary balancing criteria: (1) long-term effectiveness; (2) implementability; (3) reduction of toxicity, mobility, or volume; and (4) short-term effectiveness. The fifth primary balancing criterion, cost, is evaluated based on cost estimates

3. Long-Term Effectiveness

A remedial action will be effective in the long term if it results in permanent reductions of potential risk to acceptable levels. Potential risk reduction may occur by eliminating potential exposure to impacted media, preventing potential migration of COCs in groundwater, and eliminating principle threat sources (e.g. DNAPL) downward movement.

In comparing on-Site remedies for effectiveness in the long-term, the most protective alternatives combine containment and treatment components: OnR-5B, OnR-5C, OnR-5D, OnR-5E, OnR-5F, and OnR-5G. Alternatives with single remedy components such as removal, treatment, or containment are rated as less protective in the long-term: OnR-3A, OnR-3B, OnR-4A, OnR-4B, and OnR-5A. Alternative OnR-2 is protective with limitations, and the No Action alternative is not effective.

4. Implementability

Implementing remedial alternatives involves design, planning, construction or installation, and operation of the various components of remedial actions. The efficiency with which an alternative can be installed and operated affects how well an alternative achieves its level of protection (the first threshold criterion) and attains ARARs (the second threshold criterion). In some cases, implementation of the alternative could be technically difficult or impossible given Site-specific limitations.

A remedial alternative is judged to be implementable if it ranks highly for the following seven objectives:

- Constructability;
- Ease of operation and maintenance;
- Reliability of technologies;

- Ease of undertaking additional remedial actions if necessary;
- Ability to monitor remediation effectiveness;
- Ability to obtain technology-implementation approvals (e.g., confirmation that substantive permit requirements have been met) from regulatory agencies as necessary; and
- Availability of services and materials.

The most implementable alternatives are OnR-2, OnR-5A, OnR-5B, OnR-5C, and OnR-5E. These are primarily the most easily implemented alternatives because they are in-situ technologies and because ISBS is more easily implemented than ISS/S. The following in-situ alternatives are rated the next most implementable: OnR-4A, OnR-4B, OnR-5D, OnR-5F, and OnR-5G. Alternatives requiring soil removal are more challenging: OnR-3A and OnR-3B.

5. Reduce Toxicity, Mobility, or Volume
Alternatives that reduce mobility, toxicity, and volume (TMV) in some way must (a) slow the migration of contaminants by lowering concentration gradients within the media, or increase the strength of attachment to some solid substrate; (b) chemically alter the toxicity characteristics of the original contaminant or prevent receptors from being exposed to toxic doses of the contaminant; and (c) reduce the mass of contaminant(s) or the volume of environmental media associated with the contaminant(s).

Three objectives are used to evaluate each alternative with respect to reduction of TMV through treatment:
- Volume of potential source material treated or destroyed (and degree of TMV reduction);
- Irreversibility of treatment; and
- Minimization of treatment residuals posing potential risks.

Alternatives that result in removal of the largest mass of contaminated media achieve the greatest reduction in TMV. Alternative OnR-3B would result in nearly all on-Site contaminant mass being treated. A great majority of contaminated mass would be treated with alternatives OnR-4A, OnR-4B, OnR-5E, OnR-5F, and OnR-5G. A lesser volume of contaminated mass would be treated with alternatives OnR-3A, OnR-5C, and OnR-5D. Only some of the contaminant mass would be treated with OnR-5B, and minor amounts would be reduced through natural processes with OnR-2 and OnR-5A.

6. Short-Term Effectiveness
Short-term effectiveness of remedial alternatives relates to how well an alternative achieves a level of protection of human health and the environment (the first threshold criterion) and attains ARARs (the second threshold criterion) during implementation or installation of the remedial alternative.

Short-term effectiveness is evaluated by considering the following four objectives:
- Protection of the community during remediation;
- Protection of remediation workers during remediation;
- Protection against short-term environmental impacts; and
- Minimization of time to complete remedy construction.

Continuing current actions (OnR-2) with soil regarding/cover would be implemented the most quickly. Alternative OnR-5A would be effective the next most quickly and alternatives onR-5B and OnR-5C would be effective within months. Alternatives OnR-3A, OnR-4B, OnR-5D, and OnR-5G would require a lengthy implementation time before being effective. Alternatives OnR-3B, OnR-4A, OnR-5E, and OnR-5F require the longest implementation times before they are effective.

7. Cost
Cost is an important factor; the added benefits of alternatives with higher costs should be weighed carefully to determine whether the benefits are worth the cost.

The No Action alternative is not included in this analysis because, although it represents the lowest cost alternative, it provides no protection to receptors and achieves no RAOs. The lowest cost alternative is OnR-2 (continue with current actions with soil regrading/cover). Although this alternative cost is the lowest, it is not as protective and does not treat as much contaminant mass as other alternatives. Alternately, the highest cost alternative (OnR-3B, removal to middle clay) treats nearly all of the on-Site contaminant volume and is protective, but is likely cost prohibitive. The remaining alternatives differ in cost, but costs vary more narrowly based on the number of technologies implemented, the degree of difficulty in implementation, and time to meet RAOs.

8. State/Support Agency Acceptance
The State of Florida has been closely involved in the development and evaluation of these alternatives and supports the preferred alternative.

9. Community Acceptance
Community acceptance of the preferred alternative will be evaluated after the public comment period and will be part of the Responsive Summary in the ROD Amendment for the Site.

UFA Alternative Evaluation

1 and 2. Protection of Human Health and the Environment and Compliance with Statutory Requirements
UFA-1 (the No-Action Alternative) would fail to meet these mandatory criteria; therefore it can not be selected as a preferred remedy. Of the two UFA alternatives considered in the FS, only Alternative UFA-2, Hydraulic Containment supplemented by institutional controls and MNA, meets the two threshold CERCLA criteria. It is assumed that Alternative UFA-2 is selected as the remedial alternative for the UFA.

3. Long-Term Effectiveness
The more effective of the two UF alternatives (in the long-term) is UFA-2. It consists of hydraulic containment (to prevent expansion of the plume of dissolved contaminants) and treatment (of recovered groundwater to meet disposal requirements). Hydraulic containment and treatment will be evaluated for effectiveness and long-term institutional controls, MNA and other in situ remedial actions will be implemented to the extent necessary to meet the RAO. The No Action alternative (UFA-1) is less protective in the long-term.

4. Implementability
UFA-1 is easiest to implement because there is no remedial action involved. UFA-2 can be implemented at this site; groundwater extraction and ex situ treatment are a proven technologies. Access to the UF aquifer is restricted only by the concern of creating new migration pathways between it and contaminated aquifers above it. Institutional controls and MNA are well-established remedy components.

5. Reduce Mobility, Toxicity or Volume
Alternatives that result in removal of the largest mass of contaminated media achieve the greatest reduction in T/M/V. Alternative UFA-2 achieves some mass removal from the UF aquifer through a combination of extraction and ex situ treatment.

6. Short-Term Effectiveness
Short-term effectiveness of remedial alternatives relates to how well an alternative achieves a level of protection of human health and the environment (the first threshold criterion) and attains ARARs (the second threshold criterion) during implementation or installation of the remedial alternative.

UFA-1 (No Action) is effective by default because no remedial construction activity occurs. Remedy components of UFA-2 primarily are in situ (except for ex situ groundwater treatment); and would be protective of human health and the environment in the short term.

7. Cost

The No Action alternative is not included in this analysis because, although it represents the lowest cost alternative, it provides no protection to receptors and achieves no RAOs. Accurate cost estimation of UFA-2 depends on factors such as total volume of groundwater extracted over the entire remedy lifetime; extent of treatment needed for extracted groundwater; the need for additional extraction wells; the pump rate required to maintain hydraulic containment; and whether additional remedial action is triggered based on performance of the primary remedial components. These factors, among others, represent significant unknowns in the estimation of remedial costs of UFA-2.

8. State/Support Agency Acceptance

The State of Florida has been closely involved in the development and evaluation of these alternatives and supports the preferred alternative.

9. Community Acceptance

Community acceptance of the preferred UFA alternative will be evaluated after the public comment period. The results of that evaluation will be part of the Responsive Summary in the ROD amendment for the Site.

Off-Site Alternative Evaluation

1 and 2. Protection of Human Health and the Environment and Compliance with Statutory Requirements

Remedy OfR-1, no action, does not meet the threshold criteria of protection of human health and the environment and attainment of ARARs. Alternatives OfR-2, OfR-3, and OfR-4 are all protective and would effectively eliminate any potentially unacceptable risks due to direct contact with contaminated soil. Alternative OfR-4 allows for a flexible approach that may include institutional and/or engineering controls on properties which are suitable for such controls, and have owners that are amenable to such controls.

3. Long-Term Effectiveness

OfR-1 (No Action) is not effective at addressing contaminated soil. The other off-Site remedies are effective under different scenarios. The removal component of OfR-2 is effective in the long-term because contamination no longer remains. The effectiveness of institutional and engineering controls through OfR-3 depends on voluntary compliance. In the long-term, this remedy is less dependable than the removal component of OfR-2. Remedy OfR-4 benefits from the strengths of both OfR-2 and OfR-3.

4. Implementability

All four off-Site remedies are implementable. Soil excavation, institutional controls and engineering controls are well developed remedial techniques. The limitation to implementing any off-Site option will be property owner concurrence and cooperation.

5. Reduce Toxicity, Mobility or Volume

Remedies that remove the most contaminant mass achieve the greatest reduction in T/M/V. Although technically not a treatment, removal remedy OfR-2 and the removal component of OfR-4 eliminates contaminant mass from off-Site surface soil. OfR-1 and OfR-3 do not achieve any T/M/V reduction.

6. Short-Term Effectiveness

Short-term effectiveness of remedial alternatives relates to how well an alternative achieves a level of protection of human health and the environment (the first threshold criterion) and attains ARARs (the second threshold criterion) during implementation or installation of the remedial alternative.

OfR-1 (No Action) is effective in the short term by default because no remedial activity occurs. Remedy OfR-3 is effective in the short term because little to no disturbance occurs during implementation. In contrast, the removal components of OfR-2 and OfR-4 involve substantial soil excavation and potential increases in exposure to contaminated soil.

7. Cost

Cost is an important factor; the added benefits of alternatives with higher costs should be weighed carefully to determine whether the benefits are worth the cost.

OfR-1 is not included in the cost criterion evaluation because, although it represents the lowest cost alternative, it provides no protection to receptors and achieves no RAOs. Accurate cost estimation of the removal component of OfR-2 and OfR-4 depends on factors such as total volume of surface soil excavated from off-Site contaminated areas and the level of property owner participation. These factors, among others, represent significant unknowns in the cost estimation of soil removal in OfR-2 and OfR-4, but are already the highest cost components of the respective alternatives. The institutional and engineering control components of OfR-3 and OfR-4 are more easily estimated, but they contribute a small portion of the likely total remedial cost for those remedies.

8. State/Support Agency Acceptance

The State of Florida has been closely involved in the development and evaluation of these alternatives and supports the preferred alternative.

9. Community Acceptance

Community acceptance of the preferred off-Site remedy will be evaluated after the public comment period. The results of that evaluation will be part of the Responsive Summary in the ROD Amendment for the Site.

Preferred Alternative

The alternative preferred by EPA includes the following:

On-Site Media: OnR-5C with elements of OnR-5F

- A single, continuous vertical barrier wall (~4,800 linear ft) encircling all four source areas from land-surface to the HG middle clay (~ 65 ft bls)
- ISS/S in the Upper HG zone at all four source areas (below the Surficial Aquifer and Upper Hawthorn Clay)
- ISBS in the vadose-zone and Surficial Aquifer at all four source areas (subject to acceptable performance during pilot tests or treatability studies). In the event that ISBS does not meet its performance criteria, ISS/S will be implemented as a substitute remedy for this contaminant zone.
- ChemOx or ISBS treatment in the Lower HG at all four source areas (applied through existing wells), and along the eastern property boundary (applied through new wells) (based on performance during pilot tests or treatability studies).
- Excavation of areas of contaminated soil in non-source areas on-site; consolidation of excavated soil to source areas to be capped
- Establishment of a low-permeability cap/cover over all four source areas, including the consolidated soil excavated from non-source areas (on-site or off-site)
- Surface grading and cap covers on approximately 83 of 86 acres on the Site property.
- Installation of storm water controls and improvements (e.g., retention/ detention pond)
- Continued operation of the northern perimeter wells of the Surficial Aquifer extraction and treatment system (outside of the vertical barrier zone); decommission extraction/treatment system after cleanup goals are attained
- Continued operation of the horizontal collection drains of the Surficial Aquifer

extraction and treatment system as needed for hydraulic control.
- Expansion of the Surficial Aquifer and HG monitoring network for: (1) establishment of sentinel locations; (2) demonstration of active natural attenuation processes; and (3) establishment of trigger locations for contingency measures.
- Institutional controls to mitigate risks from exposure to Site soil, sediment, surface water or groundwater.

Alternative OnR-5C was not selected as presented in the FS because a more aggressive option was desired for the Upper HG contamination. For this reason, the ISS/S component from OnR-5F was included in the preferred alternative.

For the on-Site portion of the remedy the estimated costs are as follows:
Capital Cost and Contingency: $ 40.8M
Annual O&M: $ 165,000
Total Present Worth: $ 43.7M

Off-Site Media: OfR-4

- Range of options for off-Site soil for use on individual subparcels with consent of private property owners:
  - Excavation and removal of impacted soil that exceeds cleanup goals based on present land use (transported and consolidated within capped areas on-Site).
  - Engineering controls that prevent contact with impacted soil that exceeds cleanup goals based on present land use.
  - Institutional controls to manage access and use of land/properties.
- Surface water and sediment in Hogtown and Springstead Creeks:
  - On-site detention basin to mitigate on-going impacts
  - Excavation and removal of impacted sediment in excess of the probable effects concentration (transport and consolidate on-site)
  - Monitored natural recovery of remaining impacted sediment until concentrations reach threshold effects concentration or background levels

Upper Floridan Groundwater: UFA-2

- Hydraulic containment by groundwater extraction and treatment in areas where COCs exceed cleanup goals.
- Construction of additional extraction wells for the network, as necessary.
- MNA in areas where concentrations of COCs do not exceed cleanup goals (subject to demonstration of active natural attenuation processes).

Community Participation

EPA provides information to the community regarding Site cleanup through fact sheets, public meetings, local Site information repository, and the Administrative Record file.

EPA and FDEP encourage the public to learn more about the Cabot Carbon/Koppers Site and Superfund activities that have been conducted at the Site by visiting the Site information repositories listed on the front page of this Proposed Plan.

Public Meeting
The public meeting for the Cabot Carbon/ Koppers Superfund Site will be held on August 5, 2010 at Stephen Foster Elementary School, 3800 Northwest 6th Street, Gainesville, Florida 32609

Written Comments
Written comments on this Proposed Plan will be accepted until August 15, 2010, and should be mailed to:

Mr. Scott Miller
Remedial Project Manager
Superfund Division
Superfund Remedial Branch
Section C
U.S. EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303

Mailing List
Anyone wishing to be placed on the mailing list for this Site should send his/her request to Ms. LaTonya Spencer, EPA Community Involvement Coordinator, at the above address. You may also call Ms. Spencer with your request at 1-800-435-9234 or 404-562-8463

Information Repositories
Information concerning the Cabot Carbon/ Koppers Superfund Site may be found at the following location:

Alachua County Library
401 E. University Ave.
Gainesville, FL 32601
(352) 334-3860
www.aclib.us/locations/headquarters

GLOSSARY

Administrative Record: Material documenting EPA's selection of cleanup remedies at Superfund Sites, usually placed in the **information repository** near the Site.

Applicable or Relevant and Appropriate Requirements (ARARs): Refers to Federal and State requirements a selected remedy must attain which vary from Site to Site.

Chemicals of Concern (COCs): Contaminants associated with a Site which have been released into the environment.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA): Also known as **Superfund**, is a federal law passed in 1980 and modified in 1986 by the Superfund Amendment and Reauthorization Act (SARA); the act created a trust fund, to investigate and cleanup abandoned or uncontrolled hazardous waste Sites. The law authorizes the federal government to respond directly to releases of hazardous substances that may endanger public health or the environment. EPA is responsible for managing the Superfund.

Feasibility Study: Study conducted after the Remedial Investigation to determine what alternatives or technologies could be applicable to the Site specific COCs.

Groundwater: The supply of fresh water found beneath the Earth's surface (usually aquifers) which is often used for supplying wells and springs.

Human Health or Ecological Baseline Risk Assessment: A qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and the environment by the presence or potential presence and use of specific pollutants.

Information Repository: A library or other location where documents and data related to a Superfund project is placed to allow public access to the material.

Institutional Controls: Restriction that prevents the owner inappropriately developing the property. The restriction could be implemented as a "deed Restriction" and is designed to prevent harm to workers or potential residential development.

National Oil and Hazardous Substance Pollution Contingency Plan (NCP): The Federal Regulation that guides the Superfund program. The NCP was revised in February 1990.

Operation and Maintenance (O&M): Activities conducted at Sites after cleanup remedies have been constructed to ensure that they are properly functioning.

Proposed Plan: Superfund public participation fact sheet which summarizes the preferred cleanup strategy and the rationale and a summary of the RI/FS.

Record of Decision (ROD): A public document describing EPA's rationale for selection of a Superfund cleanup alternative.

Remedial Investigation (RI): Part one of a two part investigation conducted to fully assess the nature and extent of the release, or threat of release, of hazardous substances, pollutants, or contaminants, and to identify alternatives for clean up. The Remedial Investigation gathers the necessary data to support the corresponding Feasibility Study.

Responsiveness Summary: A summary of oral and written comments received by EPA during a comment period on key EPA documents, and EPA's responses to those comments. The responsiveness summary is a key part of the ROD, highlighting community concerns for EPA decision-makers.

Superfund: The common name used for the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), the federal law that mandates cleanup of abandoned hazardous waste Sites.

TEQ: Toxicity Equivalent Quotient for 2, 3, 7, 8-Tetrachlorodibenzo-p-dioxin (TCDD). Since there are multiple dioxins and furans with different toxic effects, so concentrations of the different dioxins and furans detected are weighted according to toxicity and collectively added to determine the TEQ.

CABOT CARBON/KOPPERS SUPERFUND SITE
PUBLIC COMMENT SHEET

Your input on the Proposed Plan for the Cabot Carbon/Koppers Superfund Site is important in helping EPA select a remedy for the Site. You may use the space below to write your comments, then fold and mail. A response to your comment will be included in the Responsiveness Summary.

Place Stamp Here

Name________________________
Address____
City_____________State______Zip_________

Scott Miller, Remedial Project Manager
Superfund Division, Superfund Remedial Branch
Section C
U.S. EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303